

## MALARIA AT WASHINGTON BARRACKS AND FORT MYER

SURVEY BY WALTER REED

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The possibilities of careful epidemiological investigations are well illustrated in a malaria survey made by Walter Reed in 1896 at Washington Barracks and Fort Myer. A copy of this report in the files of the Medical Museum of the Armed Forces Institute of Pathology furnished the material for this communication.

Washington Barracks, now known as Fort Lesley J. McNair, is located in Washington, D. C., at the southern end of Fourth Street, Southwest. It lies on a point of land formerly known as Turkey Buzzard or Greenleaf's Point, between the Anacostia River and the Washington Channel of the Potomac. In 1896, a tract of poorly drained land lay between the post and the Anacostia, and the James Creek Canal, which was an open sewer flushed by the tides, formed the eastern boundary of the post. What is now Haines Point, across the Washington Channel to the west, was then a newly made peninsula, reclaimed from the Potomac flats and covered with "... rank, vegetable growth." Fort Myer is on the Virginia side of the Potomac River, on a bluff overlooking the lowlands along the river.

Malaria parasites were first recognized in the blood of patients by Laveran in 1880, and the laboratory diagnosis of malaria by examination of the blood was just coming into use in 1896. Walter Reed's report included some data based on laboratory diagnosis, but the greater part of his statistics was based on the clinical diagnosis and gathered from hospital records. The survey was made without knowledge of the mosquito transmission of malaria, for Manson had only suggested this possibility in 1894, and it was not until 1897 that Ross demonstrated the development of malarial parasites in anopheline mosquitoes.

Walter Reed's report to the Surgeon General begins: "In compliance with the letter of instructions from your office dated 30 August 1895, I have the honor to submit the following report concerning the character and prevalence of malarial fevers at the posts of Washington Barracks, D. C., and Fort Myer, Va., during the fall of 1895, together with the result of an investigation into the probable local causations of these fevers."

In obvious recognition of the importance of annual leave, he continues: "The receipt of these instructions a few days only before my annual leave



Fig. 1

MAJOR WALTER REED ABOUT 1902

—*Courtesy Armed Forces Medical Library and  
Armed Forces Institute of Pathology.*

of absence rendered it impossible for me to begin this investigation until the first week in October." That he was not immune to annoyance from administrative assignments is reflected in the statement, "... my duty as Recorder and member of the Army Medical Examining Board interfered very much with that thorough and systematic study of the blood of the patients affected with malarial disease which was so much to be desired."

He compares the incidence of malaria at the two posts beginning with the year 1871 and finds that it is relatively the same. To him this indicates a common cause, "... the same general sanitary conditions which control the presence of malarial fevers at Washington Barracks exert a like influence over the course of the disease at Fort Myer."

Reed also discusses two theories as to the source of the disease: one that it may be in the drinking water; the other that the infection may be airborne. The medical officers at Washington Barracks favored the airborne theory. Major George W. Adair in 1894 noted a much higher incidence of malaria among the enlisted men than among officers and their families. He attributed this "largely to the fact that the men are in the habit of frequenting a path along the James Creek Canal which leads to a hole in the boundary wall; here is a highway through an unsanitary marsh, never travelled by officers, and probably most frequently used by enlisted men between taps and reveille and at a time of day when the emanations from the soil are most dangerous." Again in 1896 Major Adair recommended the cutting of weeds along the northeast border of the reservation since "... this spot forms a breeding ground for malarial germs." A report made on malaria at Washington Barracks in 1896 by Major Charles Smart, Surgeon, U. S. Army, and Dr. William Mew of the Army Medical Museum also favored the airborne theory: "The presence of malarial exhalations in this locality accounts for the prevalence of the disease. . . . Fortunately the bank [of the James Creek Canal bounding the reservation on the east] is lined with a double row of poplars and willows forming a dense screen of foliage which has no doubt done much to intercept malarious exhalations."

Washington Barracks was supplied with water from the Potomac River as was most of Washington. In rejecting the water-borne theory, Walter Reed writes: "Those who live in the more elevated section of the city away from the river front, drink Potomac water with impunity, as far as malarial disease is concerned; while those who live on the low plateau bordering both the Potomac and the Anacostia Rivers are affected annually by malarial diseases to a greater or less extent. . . . To my mind, however, still stronger evidence, if needed, that the source of malarial fevers





Fig. 2

## WASHINGTON ABOUT 1896

The arrow points to Washington Barracks. The Anacostia River is in the upper left and the Potomac River in the upper right. Haines Point lies between the Potomac and the Washington Channel.

—Courtesy Washington Public Library and  
Armed Forces Institute of Pathology.

at Washington Barracks is not due in any sense to its water supply, is the marked effect observed upon the prevalence of this disease by the occurrence of one or two light frosts. While I can understand that such a reduction in temperature would quickly check the development of the parasite present in the air, or immediately upon the surface of the soil, I cannot conceive how such a slight reduction in temperature could possibly affect the immense volume of water contained in the Potomac River.

"I therefore conclude that the source of the malarial fevers at Washington Barracks can be referred to the development of the specific cause of malaria partly in the soil upon which the post is located and to a still greater degree to its development in the extensive marsh lands lying in and along the Potomac and Anacostia Rivers."

A special report on the water supply and fevers at Fort Myer made in 1893 by Major Smart and Dr. Mew noted that the incidence of fever at Washington Barracks was as high as at Fort Myer, but there was "... one notable difference in the character of these two posts, i. e., remittents exclusively prevailed at Fort Myer, intermittents at Washington Barracks; and this has a bearing on the probability of unwholesomeness of the water at the former post, for when malarial fevers are recognized as due to malarious waters the fever is generally of the remittent type.

"In view of these observations it is evident that an adequate supply of good water should be obtained for Fort Myer. Such a supply would probably put an end to its remittent fevers, and the elevation of the post would probably keep it free from the intermittents which infest such low grounds as those of Washington Barracks."

In those days, malaria was recognized as appearing in an intermittent form with a rise in temperature every 48 hours and a remittent form with a more constant fever. Today we know the intermittent form as tertian malaria and the remittent type was easily confused with typhoid fever and hence the association of the remittent type with "malarious waters."

In commenting on this report, Walter Reed states: "I am reluctant to disagree with the general conclusion of the report that malarial fevers at Fort Myer during the year 1892 were due to its unwholesome water supply. I think, however, that the occurrence, on the one hand, of a large excess of intermittent fever at Washington Barracks occasioned by emanations from the marshes (hence airborne) and the prevalence of remittent fever, on the other hand, at Fort Myer, brought about by the use of unwholesome water would be of very great import, *if true*; but I do not believe that this position can be sustained. Certainly if the almost exclusive prevalence of remittent fever during the year 1892 was occa-



sioned by an unwholesome water supply, the same water supply should produce remittent fever in excess over intermittents in 1893 and 1894. On the contrary I find that during these years when malarial diseases were largely increased, intermittent fevers prevailed almost exclusively at Fort Myer. Indeed a careful examination of the medical records of the post will show that only during Major White's incumbency as Post Surgeon, did remittent fever prevail to any great extent at this station. During all the other years intermittents largely predominate, as at Washington Barracks, and remittents only appear, few in number, during the later fall months.

"It is hardly necessary for me to remark that remittent or estivo-autumnal fevers appear in a malarious climate, chiefly during August or September, and this occurs irrespective of a good or bad water supply.

"Since with an unchanged water supply intermittent fevers prevailed almost exclusively during the years 1893 and 1894, the question arises, were not these occasioned by emanations from the Potomac flats rather than by the quality of the drinking water? Fortunately a change of water supply made in November 1894 enables a more correct answer to be given to this question than would otherwise have been possible, and to my mind, throws much light on the etiology of malarial disease at Fort Myer.

"During the year 1895 this post was supplied with Potomac River water, the old supply [from springs and wells] being entirely cut off. In addition beginning in January, 1895, the enlisted men drank water which had been filtered through Pasteur filters, as a greater precaution against malarial and typhoidal infection; officers and their families drank water filtered through Columbia filters, and which was afterwards boiled."

In spite of these precautions malaria was more prevalent at Fort Myer in 1896 than in the preceding 23 years! Washington Barracks, where unboiled, unfiltered Potomac river water was used, showed a similar high incidence of malaria. Walter Reed continues, "This occurrence of a higher admission rate for malarial diseases, with a new water supply, raises a grave doubt, naturally, whether the old water was the channel through which malarial infection reached the garrison of Fort Myer." And he concludes that the source of the infection does not lie in the water supply but that malarial fevers at both Washington Barracks and Fort Myer have a common origin and that the "... source of infection ... can be found in the marshlands of the Potomac."

Thus on epidemiological evidence Walter Reed eliminated drinking water as a source of malaria, and correctly implicated airborne "emanations"—but the "emanations" had wings!